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Team Product Document

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Abstract

This Operating Procedure describes the Radioactive Contaminated Water Processing System (RCWPS) in the RMHF.

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Supporting Document

Summary of Change

Rev.	Summary of Change	Approvals and Date
A	Procedure revised to describe the operation of a new, stand-alone, evaporator system required by the dismantlement of the previous facility system; minor editorial changes.	R. Marshall R. Amar P. Waite **RELEASE 04-05-06 CV**

TABLE OF CONTENTS

Page

FIGURES

1. OBJECTIVE

The objective of this procedure is to describe the Radioactive Contaminated Water Processing System (RCWPS), and to provide instructions for system operation, maintenance, and evaporator cleanout. The system is located in the RMHF, and is used to store and evaporate radioactive contaminated water produced by the D&D operations at the RMHF or other ETEC facilities.

2. APPLICABLE DOCUMENTS

EID-04482 Packaging and Shipment of Radioactive Waste

EID-04451 On-Site Transfer of Radioactive Material

3. GENERAL DESCRIPTION

The RCWPS consists of the following elements:

(1) The Radioactive Water Transfer Tank (RWTT) which is a portable plastic tank used to transfer contaminated water from other facilities to the RCWPS at the RMHF, and the Radioactive Water Storage System (RWSS) including Intermediate Water Tanks (IWTs) and portable pumps located at the RMHF.

(2) The Radioactive Water Evaporation System (RWES) consisting of the water evaporator, a holding tank, filters, pump, process control system and interconnecting piping located on the evaporator unit.

4. DETAILED DESCRIPTION

4.1 RADIOACTIVE WATER TRANSFER TANK (RWTT)

Radioactive water from D&D activities at ETEC is delivered to the RMHF in a portable 500-gallon Radioactive Water Transfer Tank (RWTT). Process knowledge of the water source is used to control the incoming water to the RMHF. The water from the RWTT is then transferred to the IWT and stored until transferred to the evaporator system.

4.2 RADIOACTIVE WATER EVAPORATION SYSTEM (RWES)

The RWES Schematic is shown in Figure 1. The RMHF portable RWES consists of an atmospheric evaporator, a holding tank, filters, pump and process control systems. The water evaporation is a batch-type operation fed by water from a cone-bottom holding tank located on the evaporator unit. Periodically, the solids are removed from the evaporator for packaging and disposal per EID-04482. The RWES is an automatically controlled, minimum maintenance process, in which water level and heat input parameters are controlled. Interlock functions are provided for high and low water level , and over-temperature. The operating controls are located on the evaporator unit.

4.2.1 **Atmospheric Evaporator**

The atmospheric evaporator consists of a stainless steel V-bottomed tank manufactured by the Equipment Manufacturing Corporation (Model 125E-SS). The evaporator tank is covered by an exhaust hood for connection to the facility HEPA system or a portable HEPA filtered exhaust blower. The evaporator cleanout port is located at the lowest point of the evaporator tank bottom.

4.2.2 **Filters**

Four sock-type water filters are located between the tank outlet and evaporator inlet pump on the evaporator unit.

4.2.3 **Pump**

The evaporator feed water inventory is controlled by on-demand pumping from the holding tank. The pump is located between the filter bank outlet and the evaporator. The Pump operation is controlled by a level probe in the evaporator tank.

4.2.4 **Evaporator Water Level Control**

The evaporator water level is controlled by a float switch located in the evaporator tank. Water is fed to the evaporator when the water level drops below the float set level. The same float switch turns power to the heaters off when the water level remains below the float set level. (Refer to the 'EMC Water Eater Evaporator Installation & Operation Manual' for more details on process controls)

4.2.5 **Evaporator Water Temperature Control**

The evaporator water temperature is sensed by a thermocouple immersed in the water in the approximate plane of the heaters. The temperature signal is directed to an on/off type temperature controller with a high set point of 220^0F. The temperature control is located on the evaporator.

5. RADIOACTIVE WATER EVAPORATION SYSTEM (RWES) OPERATION

Radioactive water generated during the D&D of ETEC Facilities and routine RMHF operations is stored at the RMHF and evaporated on an as-needed basis. Water evaporation is accomplished using the Evaporator Unit. The Evaporator Unit consists of a cone-bottom holding tank, a holding tank fill pump, a filter bank, an electric evaporator and an evaporator fill pump all mounted on a forklift transportable skid. The skid allows the unit to be located and operated throughout the RMHF.

For more details on operation of the evaporator unit, refer to the 'EMC Water Eater Evaporator Installation & Operation Manual'. Use the following instructions and refer to Figures 1 and 2 to operate the unit:

5.1 Locate the evaporator unit as directed by the facility PIC and attach the evaporator exhaust to the facility HEPA system or to a portable HEPA exhaust blower.

5.2 Verify HEPA exhaust system is operating.

5.3 Plug in both the evaporator power cord (480 v) and the holding tank fill pump cord (110 v).

5.4 Turn on the main switch box located on the evaporator unit.

NOTE: The evaporator exhaust fan may start if the temperature control switch is on.

5.5 Using the tank fill pump, fill the cone-bottom holding tank to the level indicated on the tank.

NOTE: The holding tank can be filled using either the tank fill pump or any other convenient method.

5.6 Verify that one set of the filter bank inlet and outlet valves are **OPEN** and the other set of filter bank inlet and outlet valves are **CLOSED**.

5.7 **OPEN** either the holding tank's drain valve (V1) or the holding tank's pump valve (V2).

5.8 Turn OFF the Auto Fill and Heater switches.

5.9 Actuate and hold the evaporator "pump" switch and allow the evaporator to fill to approximately 3" above the heaters.

NOTE: If the water level is too low the heaters will not turn on.

5.10 Following the directions in the evaporator Operating Manual, turn **ON** the evaporator heater and switch controls to "Auto Fill".

NOTE: Water level in the evaporator will be maintained as long as water is available in the holding tank. The evaporator heaters will turn off when water evaporation is complete.

5.11 Maintain a nominal water level in the holding tank until evaporator operations are complete, i.e., all radioactive water requiring evaporation has been evaporated.

CAUTION: Operation of the facility HEPA system or the portable HEPA exhaust blower must continue while the evaporator is on.

5.12 Close or verify that both the holding tank's drain valve (V1) and the holding tank's pump valve (V2) are closed Turn off all switches including switch box.

6. RADIOACTIVE WATER EVAPORATION SYSTEM (RWES) MAINTENANCE

Maintenance of the evaporator unit is required on a periodic basis and is mainly dependent on two factors: the quantity of water evaporated and the quantity of solids in the water being evaporated. The evaporator unit is equipped with a filter bank that allows filters to be changed during operation. Cleanout of the evaporator tank can only be performed when the unit is OFF and EMPTY. For more details on maintenance of the evaporator unit, refer to the 'EMC Water Eater Evaporator Installation & Operation Manual'.

6.1 FILTER MAINTENANCE/REPLACEMENT

The filter bank consists of four sock-type filters, two on each leg of the bank. The filter bank is located between the holding tank and the evaporator fill pump. During normal evaporator unit operation, water is run through only one leg of the bank. If filters require replacement during operation, the water flow can be diverted to the second leg of the bank to allow replacement of the filters. Each of the two legs of the filter bank is equipped with a differential pressure gauge. Filter replacement is required when the pressure drop across the filters (Δp) is greater than five PSI, refer to Figures 1 and 2. Prior to performing filter replacement, the PIC shall initiate Form 719 L (Controlled Work Permit) and the facility HP shall prescribe required PPE and contamination controls.

6.1.1 Verify that the inlet and outlet valves to the filter diversion leg of the filter bank are **OPEN**.

6.1.2 **CLOSE** the inlet valve on the leg of the filter bank that has the filters to be changed.

6.1.3 Observe the pressure on the filter housings of the filters to be changed and verify the pressure is **ZERO**.

WARNING: IF THE PRESSURE ON THE FILTER HOUSINGS IS NOT ZERO STOP! DO NOT PROCEED, NOTIFY PIC.

6.1.4 **CLOSE** the outlet valve on leg of the filter bank that has the filters to be changed.

6.1.5 **SLOWLY** loosen the lid clamps on one of the two filter housings while observing the lid to housing joint for indications of leakage.

WARNING: If any indication of pressurized leakage is observed **STOP**, retighten lid clamps and notify PIC.

6.1.6 Swing the lid clamp bolts off the lid and slowly remove the lid and attached water displacement cylinder from the housing.

CAUTION: Water will drip from the lid and attached water displacement cylinder. Steps to prevent contamination must be in place.

6.1.7 Hook or grasp the fabric bail attached to the filter and slowly withdraw the sock filter from the filter housing.

CAUTION: Water will drip from the filter. Steps to prevent contamination must be in place.

6.1.8 Inspect the inside of the filter housing and remove any debris. If necessary the internal screen can be removed, cleaned and reinstalled.

CAUTION: Water will drip from the screen. Steps to prevent contamination must be in place.

6.1.9 Install a new filter into the filter housing being sure that the fabric bail is out of the way of the water displacement cylinder.

6.1.10 Replace the lid and attached water displacement cylinder onto the filter housing and slowly and evenly tighten the lid clamp bolts.

NOTE: The lid clamp bolts need to be "hand-tight" only. Do not use tools to tighten the clamp bolts.

6.1.11 Repeat steps 6.1.4 through 6.1.10 to replace the second filter.

6.1.12 **OPEN** the outlet valve on the newly changed filter leg of the filter bank.

6.1.13 **OPEN** the inlet valve on the newly changed filter leg of the filter bank.

6.1.14 **CLOSE** the inlet valve to the filter diversion leg of the filter bank.

6.1.15 **CLOSE** the outlet valve from the filter diversion leg of the filter bank.

6.1.16 Check all fittings and the filter housing lids for leaks.

6.1.17 Clean up work area, perform any required decontamination activities and put away tools. Package and dispose of used filters and associated waste as directed by the PIC.

6.2 EVAPORATOR CLEANOUT

Cleanout of the evaporator is via the evaporator tank drain port and is to be performed only when power to the evaporator unit is disconnected. Evaporator cleanout will be performed when the PIC determines it is necessary or whenever sediments in the evaporator tank reach within two inches of the heating elements. Prior to cleanout of the evaporator tank the PIC shall initiate Form 719 L (Controlled Work Permit) and the facility HP shall prescribe required PPE and contamination controls.

6.2.1 Verify evaporator unit power cord is disconnected from power supply.

6.2.2 Place a five-gallon pail under the evaporator tank drain valve.

6.2.3 Slowly open the drain valve and allow water/sediment to drain into the pail.

6.2.4 Using a high pressure/low volume water spray, rinse the evaporator tank of any remaining sediment.

6.2.5 Verify the evaporator drain valve is closed.

6.2.6 Clean up work area, perform any required decontamination activities and put away tools. Package and dispose of water/sediment and associated waste as directed by the PIC.

6.3 EVAPORATOR UNIT CONE-BOTTOM HOLDING TANK CLEANOUT

Cleanout of the evaporator system cone-bottom holding tank is required whenever excess sediments have accumulated around the drain port of the holding tank. Cleanout is to be performed only after the tank is empty. Prior to cleanout of the cone-bottom holding tank, the PIC shall initiate Form 719 L (Controlled Work Permit) and the facility HP shall prescribe required PPE and contamination controls.

6.3.1 Verify that one of the filter bank inlet and outlet valves are **OPEN** and the other filter bank inlet and outlet valves are **CLOSED**.

6.3.2 **OPEN** the holding tank's drain valve.

6.3.3 Turn **ON** the evaporator fill pump.

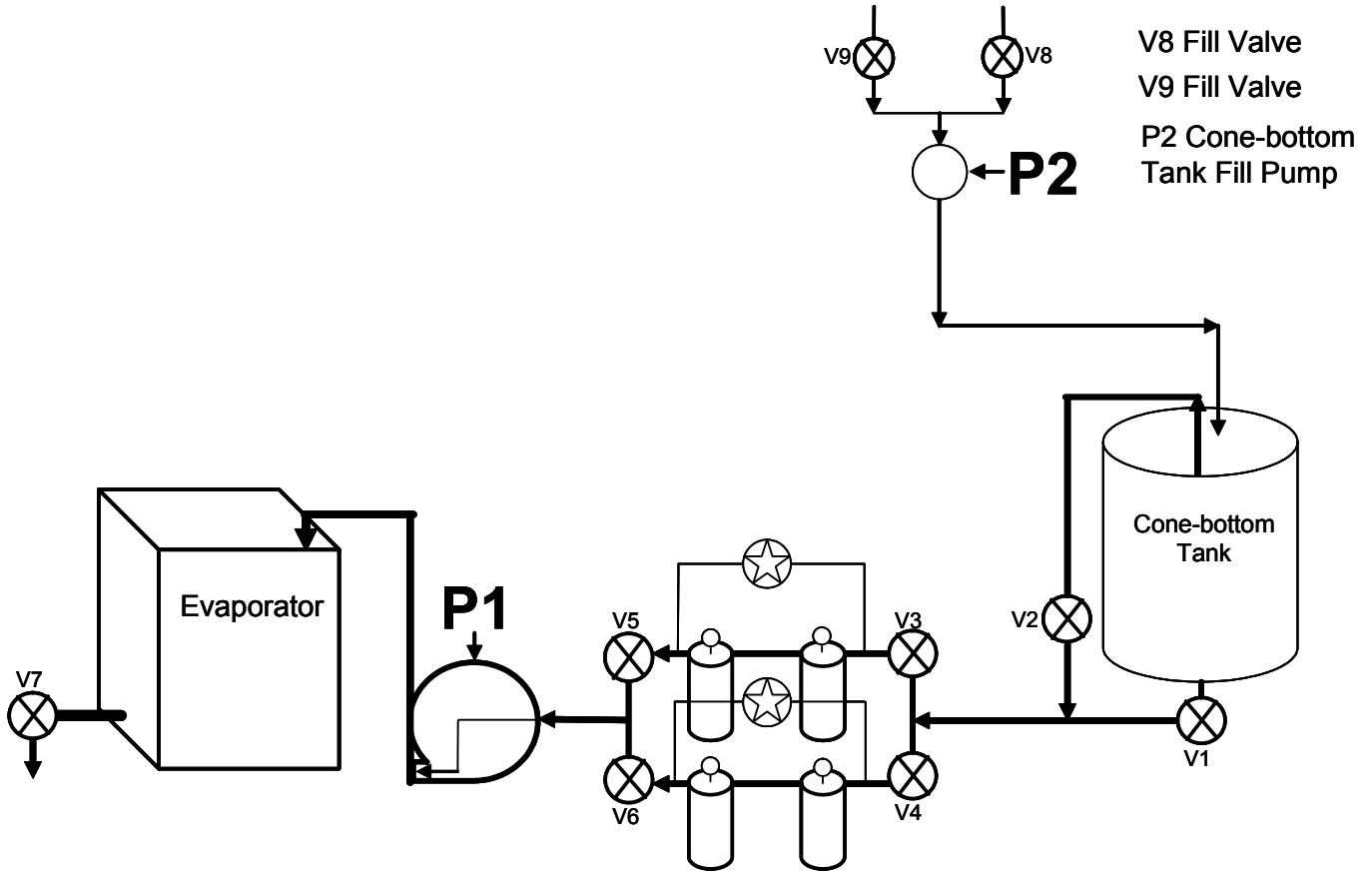
6.3.4 Using a high pressure/low volume water spray, rinse the tank and drain area and flush any sediment into the drain.

6.3.5 Turn **OFF** the evaporator fill pump.

6.3.6 **CLOSE** the holding tank's drain valve.

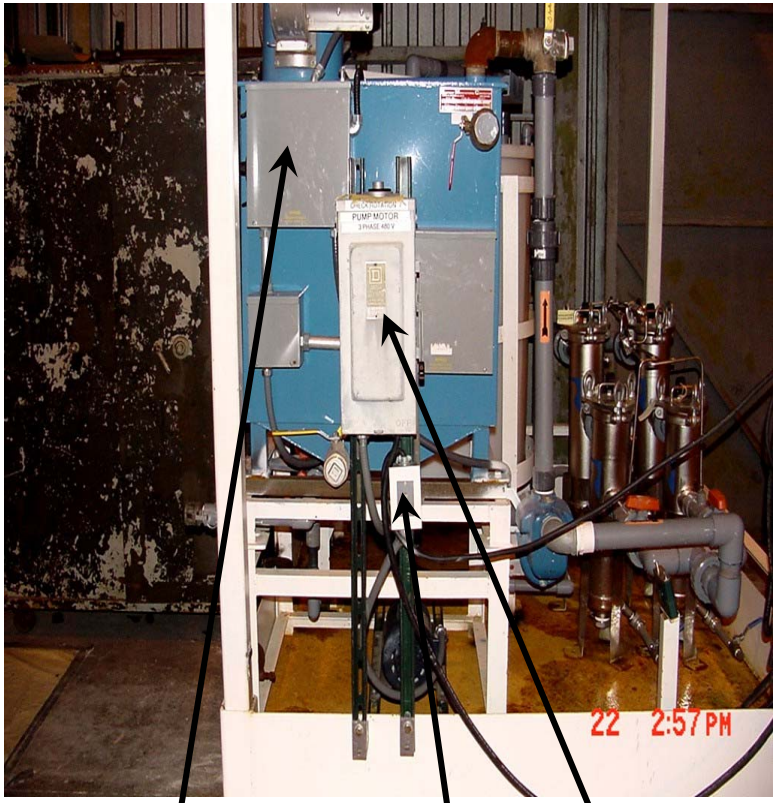
6.3.7 Clean up work area, perform any required decontamination activities and put away tools. Package and dispose of any water/sediment and associated waste as directed by the PIC.

Figure 1: Radioactive Water Evaporation System (RWES) Schematic



P1 Evaporator Fill Pump
V1 Tank Drain Valve
V2 Tank Pump Valve
V3 Filter Bank "A" Inlet Valve
V4 Filter Bank "B" Inlet Valve
V5 Filter Bank "A" Outlet Valve
V6 Filter Bank "B" Outlet Valve
V7 Evaporator Drain Valve
☆ Filter Bank Differential Pressure Gauge

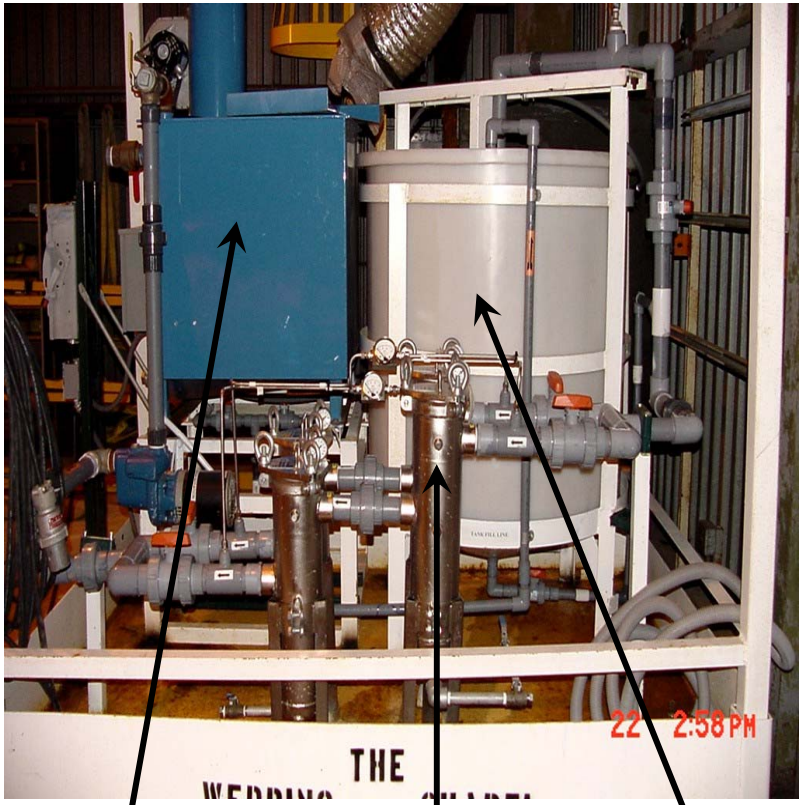
Figure 2: Radioactive Water Evaporation System



Evaporator Pump Switch & Temperature Control

Holding Tank Fill Pump Switch

Main Switch Box



Evaporator

4 sock-type Filters

Holding Tank